Background corss section for 8TeV

- ATLAS NOTE(January 24, 2014): Search for resonant and enhanced non-resonant dihiggs production in the $\gamma\gamma b\bar{b}$ channel with 20.3 fb^{-1} of data at 8 TeV.

- Major background processes

Sample	Xsection [fb]
$bb\gamma\gamma$	8.30
$bbj\gamma$	39.58e3
$bbjj$	8.66e6
$bj\gamma\gamma$	79.8
$bjj\gamma$	1.83e5
$jj\gamma\gamma$	1510

Background corss section for 14TeV

- MG5 parton level simulation, $p = g, u, d, c, s, b, \bar{u}, \bar{d}, \bar{c}, \bar{s}, \bar{b}$.

MG5	Xsection[fb] 8TeV	Xsection[fb] 14TeV	Ratio(14/8)
$bb\gamma\gamma$	8.423	20.52	2.44
$bbj\gamma$	39.82e3	105.4e3	2.65
$bbjj$	8.669e6	24.33e6	2.81
$bj\gamma\gamma$	79.8	197.8	2.48
$bjj\gamma$	1.836e5	5.042e5	2.75
$jj\gamma\gamma$	1510	3131	2.07

Higgs production

- gluon-gluon Fusion Process.

m_H[GeV]	Xsection[pb] 8TeV	Xsection[pb] 14TeV	Ratio(14/8)
100	29.68	73.27	2.47
125	19.27	49.85	2.59
200	7.081	20.16	2.85
300	3.594	11.05	3.07
400	2.921	10.87	3.72
500	1.283	5.255	4.10
600	0.5230	2.332	4.46

Higgs production

- VBF Process.

m_H[GeV]	Xsection[pb] 8TeV	Xsection[pb] 14TeV	Ratio(14/8)
100	1.988	5.114	2.57
125	1.578	4.180	2.65
200	0.8685	2.472	2.85
300	0.4408	1.358	3.08
400	0.2543	0.8422	3.31
500	0.1561	0.5684	3.64
600	0.09688	0.3965	4.09

- HW Process.

m_H[GeV]	Xsection[pb] 8TeV	Xsection[pb] 14TeV	Ratio(14/8)
100	1.447	3.002	2.07
125	0.7046	1.504	2.13
200	0.1305	0.3004	2.30
300	0.02649	0.06755	2.55

- HZ Process.

m_H[GeV]	Xsection[pb] 8TeV	Xsection[pb] 14TeV	Ratio(14/8)
100	0.8102	1.683	2.08
125	0.4153	0.8830	2.13
200	0.08491	0.1936	2.28
300	0.01627	0.04156	2.55

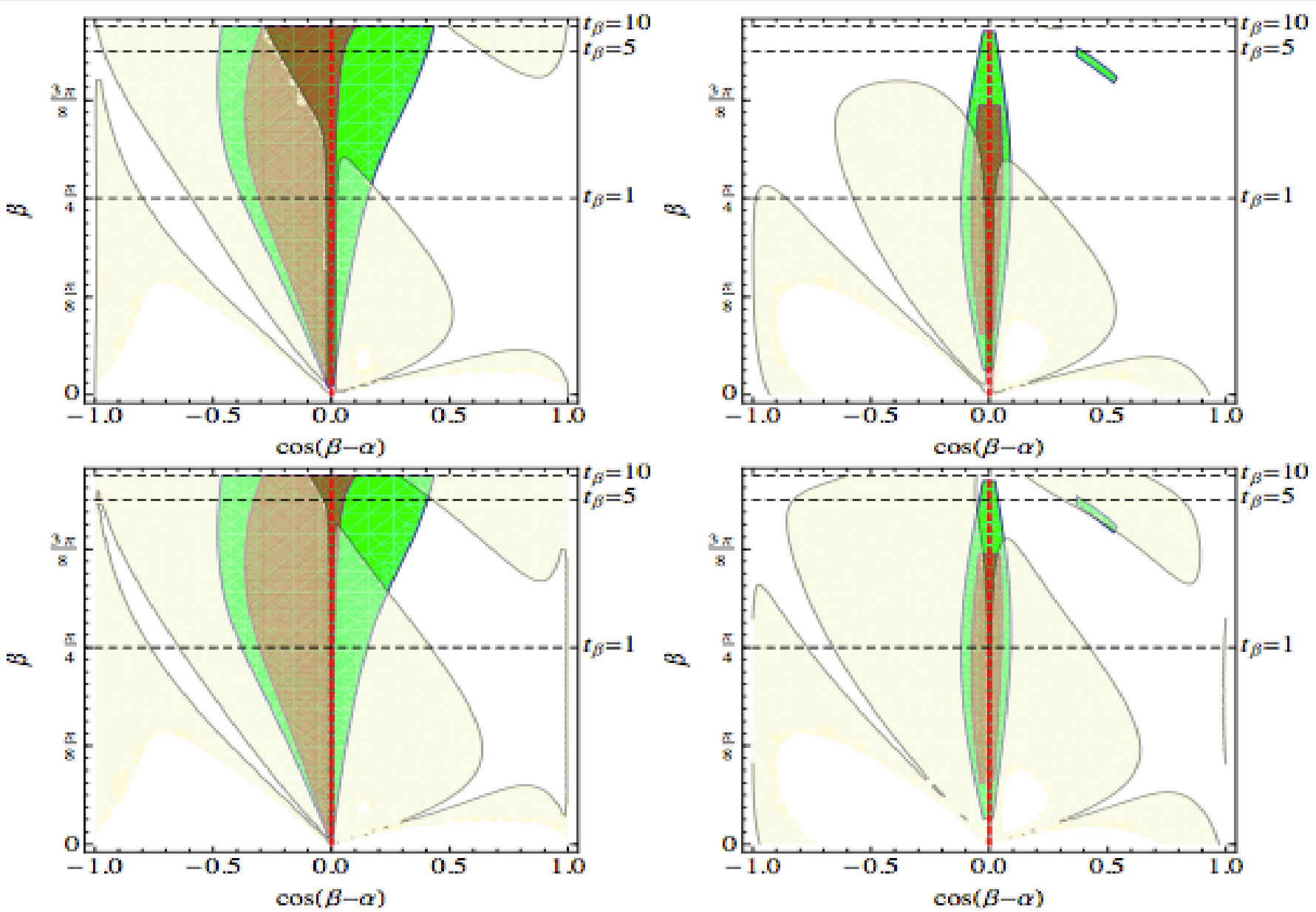
- ttH Process.

m_H[GeV]	Xsection[pb] 8TeV	Xsection[pb] 14TeV	Ratio(14/8)
100	0.2433	1.114	4.58
125	0.1293	0.6113	4.73
200	0.02858	0.1532	5.36
300	0.007721	0.05133	6.65

- Changing plots: (α, β) plane $\rightarrow \Big(\cos(\beta-\alpha), \beta\Big)$ plane.

- The LHC-14 search sensitivities to the $H \rightarrow b\bar{b}\gamma\gamma$ final states on the $\Big(\cos(\beta-\alpha), \beta\Big)$ parameter space. Upper left: 2HDM-I for the $\int \mathcal{L}dt = 100$ fb^{-1}, upper right: 2HDM-II for the $\int \mathcal{L}dt = 100$ fb^{-1}, lower left: 2HDM-I for the $\int \mathcal{L}dt = 3000$ fb^{-1}, and lower right: 2HDM-II for the $\int \mathcal{L}dt = 3000$ fb^{-1}. The yellow shadow in each plot represents the parameter regions within the reach(satisfy $S \geq \max\{5\sqrt{B}, 10\}$) via the $b\bar{b}\gamma\gamma$ final states. The green and brown bends are the global fit to the 125 GeV Higgs boson in the 2HDM at the 68% and 95% CLs.

Modification



Modification

- Adding plots: $(M_H, \tan\beta)$ plane.
- The signal reaches for the $H \to b\bar{b}\gamma\gamma$ searches on the $(M_H, \tan\beta)$ plane. Upper left: 2HDM-I for the $\int \mathcal{L}dt = 1000$ fb^{-1}, upper right: 2HDM-I for the $\int \mathcal{L}dt = 3000$ fb^{-1}, lower left: 2HDM-II for the $\int \mathcal{L}dt = 1000$ fb^{-1}, and lower right: 2HDM-II for the $\int \mathcal{L}dt = 3000$ fb^{-1}. Parameter regions of $(M_H, \tan\beta)$ in orange color are within the reach(satisfy $S \geq \max\{5\sqrt{B}, 10\}$) for each case.

Modification